the

Watershed Recovery Inventory Project

First Draft Report
November 1997

Acknowledgments

This project would not have been successful without the dedication and expertise of WDFW employees. My deepest thanks for your contributions and support. Also, sincerest appreciation to Karol McFarlane, Terry Johnson, Troy Matheny, members of the Steering Committee, and Task Leaders.

Thank you also to the many agencies, organizations, and citizens who responded to the request for information. It is in your efforts that we find hope.

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INTRODUCTION

The State of Washington is faced with a crisis in the condition of many of our salmon, steelhead, bull trout, and cutthroat populations. The National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) are considering several salmonid stocks for listing under the Endangered Species Act (ESA). Steelhead were recently listed as endangered in the upper-Columbia River and threatened in the Snake River and mid-Columbia River. Similar listings are under consideration in the lower Columbia River.

Based upon findings identified in these status reviews thus far, other species that, in the best judgement of the Washington Department of Fish and Wildlife (WDFW), have a high potential for formal listing as "threatened" or "endangered," or designation as a "candidate" species for future listing, within the next two years are:

- Southwest Washington coastal coho - "threatened"
- Hood Canal/Strait of Juan de Fuca summer chum - "threatened"
- Lower Columbia River chum - "endangered"
- Lake Ozette sockeye - "threatened"
- Puget Sound chinook - "threatened"
- Upper Columbia River spring-run chinook - "threatened"
- Lower Columbia River cutthroat - "threatened"
- Columbia River Basin bull trout - "threatened" or "endangered"

The reason for decline in salmonid populations are many and include habitat loss, over fishing, poor ocean survival, inappropriate use of hatcheries, lack of coordination on watershed efforts, and others. The Washington Department of Fish and Wildlife is in the final stages of development of a statewide Wild Salmonid Policy which summarizes the challenges salmonid populations face and establishes a vision for salmonid management in the state.

With the trend toward using a watershed approach for natural resource management and the increased responsibility to recover listed salmonid stocks, stabilize fish populations, and avoid other listings come a number of questions, such as: Which factors limit salmonid production within a watershed? what habitat needs to be restored and where? where should salmonid supplementation be utilized? which watersheds should receive attention first?

Many pieces required to answer these questions have already been compiled at various times and for various reasons. These efforts must be brought together and expanded toward a holistic watershed approach to salmonid recovery.

THE WATERSHED RECOVERY INVENTORY PROJECT

The Watershed Recovery Inventory Project (WRIP) was initiated to develop an inventory of watershed restoration projects and salmonid habitat information. The information is needed to respond effectively to the challenges and opportunities presented by the potential salmonid listings under the federal ESA. This report summarizes our findings after 14 weeks of data collection. The information provided in this report should not be viewed as a comprehensive list of the requested information due to the limited time available for data collection. Rather, it is an initial review of material available on salmonid habitat that can help assess our preparedness for addressing salmon recovery and point to a direction for continued work.

The WRIP provides an inventory of information that may help in developing recovery and protection plans. There are excellent examples, such as the Salmon and Steelhead Habitat Information and Assessment Project (SSHIAP) or the Willapa Salmon Recovery Plan, of how information may be analyzed to identify protection and restoration priorities.

Several tasks were conducted within the WRIP. A prioritized list of watersheds was developed to help direct agency recovery activities, and information was collected on the following parameters that affect salmonid productivity for each Watershed Resource Inventory Area (WRIA) of the state:

- ❑ Restoration and Protection Projects
- ❑ Watershed Assessments
- ❑ Monitoring Projects
- ❑ Fish Passage Barriers
- ❑ Water Quality
- ❑ Stream Flow Problems
- ❑ Stream Channel Complexity and Sedimentation
- ❑ Fish Supplementation
- ❑ Databases

Three primary types of information were collected through this project: geographic (or spatial), tabular, and narrative. Information was collected from WDFW biologists, state and federal agencies, tribes, Conservation Districts, Regional Fish Enhancement Groups, major landowners, county governments, and a limited number of environmental organizations.

RESULTS

Priorities for Implementation

The prioritization process was developed to answer the question:

> *Which watersheds should be given priority for restoration in order to reverse the trend of declining salmon, steelhead, bull trout, and cutthroat populations?*

The list of watersheds was developed to help guide state and federal funding for salmonid restoration project implementation. The priorities are based upon salmonid stock health and the ESA listing, or potential for listing, of a species within a WRIA.

The list identifies four categories: high, medium, or low priority, and watersheds with no salmonid species of concern. The WRIAs within the high priority category are:

WRIA #	WRIA Name
18	Elwha-Dungeness
25	Grays-Elokoman
26	Cowlitz
1	Nooksack
27	Lewis
48	Methow
29	Wind-White Salmon
28	Salmon-Washougal
16	Skokomish-Dosewallips
35	Mid Snake
45	Wenatchee
15	Kitsap
17	Quilcene-Snow

A ranked list of all WRIAs, maps of these priorities in relation to Evolutionarily Significant Units (ESU) for each species, and a detailed explanation of the process can be found in Appendix A.

The watershed priorities are based on WRIAs and driven by stock status. This choice was made because restoration activities target individual stocks and because WRIAs are a logical unit of measure for restoration planning. This list reflects landscape rather than species-specific priorities. Because it is landscape based, it will help landowners and project implementors address multiple species of concern.

Although westslope cutthroat have recently been petitioned for listing, they were not included at this time. Once stock status and listing information become available, the list can be updated to reflect new information on at-risk stock.

Restoration and Protection Projects

Information was collected on projects that have been completed since 1993 as well as planned and proposed projects. Nine hundred seventy one (971) restoration and protection projects were identified by 21 respondents (Appendix B). Of these, 399 were identified as completed or ongoing watershed restoration projects. Project costs were provided for only 227 projects. These costs totaled $7,163,001, or approximately $31,555 per project. Restoration programs such as Jobs for the Environment and the Centennial Clean Water Program were not included at this time.

A total of 239 planned, proposed, or potential restoration and protection projects were identified in our survey, amounting to an estimated funding need of $226,648,835.

Status for the other 333 projects was not identified in the survey. No attempt was made to correlate these projects with watershed assessment findings or screen these projects for their ability to affect the health of salmonid populations. To ensure the effectiveness of the planned projects in future recovery efforts, these steps must be taken. For further details on the methods used, please refer to Appendix K.

Watershed Assessments

A total of 413 watersheds assessments, covering 49 of the 62 WRIAs in the state, were identified through the WRIP. A list of the assessments is provided in Appendix C. These assessments do not follow a uniform format and may need to be expanded to address all of the concerns in salmonid recovery. For example, a flood control assessment may be done but, with additional work, could be expanded to include other salmonid recovery concerns. As well, many of the assessments cover smaller areas within a WRIA and could be expanded to address the entire watershed. Assessments at the watershed scale allow us to evaluate where habitat conditions are limiting fish production and more effectively target restoration. For further details on the methods used, please refer to Appendix K.

Monitoring Projects

Forty-one monitoring programs/projects were identified (Appendix D). Most of the monitoring projects identified address salmonid population. Not all respondents identified average annual costs, but for those that did, the average annual expense was about $32,000. Additional information on monitoring programs is available through SSHIAP for WRIAs 1-23. However, despite the amount of habitat restoration underway, little monitoring on salmonid habitat is conducted. This is unfortunate because monitoring would allow us to evaluate whether restoration,

land use regulations, or basin planning are halting the decline in salmonid populations. For further details on the methods used, please refer to Appendix K.

Fish Passage Barriers

Information on fish barriers resides in a number of different databases and reports. Collecting this information into a common comprehensive list was not feasible during this phase of WRIP. However, estimates for barriers under state, county, and private ownership in the SSHEAR and StreamNet databases total 3565 (Appendix E). In addition, 122 barriers were mapped through agency workshops. Some overlap may exist between these lists. For further details on the methods used, please refer to Appendix K.

An over all *estimate* of the cost to restore fish passage is $200-300 million based on average costs of past work and estimated numbers of barriers to be removed.

Water Quality

Using the Department of Ecology's 303(d) information, a list of water quality impairments with the potential to affect fish productivity were identified by WRIA (Appendix F). Water quality impairments which may impact fish are found in 54 of the 62 WRIAs. Further information on water quality may be found in DOE's *1996 Washington State Water Quality Assessment Section 305(b) Report.* For further details on the methods used, please refer to Appendix K.

Stream Flow Problems

A total of 195 streams with high flow problems and 326 streams with low flow problems were identified (Appendix G). Some watershed assessments have identified the cause of some of these high and low flow problems. Evaluation of the factors which cause high and low flow problems should be identified for each stream in which flows impact fish productivity. For further details on the methods used, please refer to Appendix K.

Stream Channel Complexity and Sedimentation

A total of 373 stream segments with active or at high risk of mass-wasting were identified (Appendix G). As well, 296 stream segments that are no longer connected to the flood plain were identified. For further details on the methods used, please refer to Appendix K.

Fish Supplementation

Results of the supplementation task are presented in two components: 1) current supplementation activities, and 2) candidate supplementation activities. Some projects are included on both the current and the candidate lists. In these cases, the current program may not exactly fit the intent of supplementation, but they need to be reevaluated in terms of how they would best be modified for wild stock rehabilitation. The stocks identified in this process were limited to stocks with the most serious needs.

Twenty-seven supplementation programs are currently underway and 45 are identified as candidates (Appendix H). For further details on the methods used, please refer to Appendix K.

Databases

A significant amount of information resides within databases both within and outside of WDFW. Given the volume of information within these databases and the different software programs in which these databases were developed, it was not feasible to gather all site-specific data into a common format within the timeline of the WRIP. Instead, a directory of databases was developed in order to catalog the location and content of databases that will be of value in salmonid recovery planning and project identification. A total of 270 databases were identified and are listed in Appendix I. For further details on the methods used, please refer to Appendix K.

Map Products

To demonstrate how the Geographic Information System (GIS) may be used to examine habitat information, maps of salmonid habitat data were developed for WRIA 27, the Lewis watershed (Appendix J). The Lewis watershed is within the lower Columbia ESU for steelhead and is of priority interest to Fish Management. For further details on the methods used to gather the information, please refer to Appendix K.

The maps show patterns of habitat degradation. These suggest areas where restoration and protection projects may be targeted for maximum effectiveness. Through the analytical capability of GIS, potential relationships between habitat factors or habitat factors and fish could be identified.

This GIS mapping exercise should be extended to other WRIAs, particularly those identified as priorities for restoration.

CONCLUSIONS

The WRIP identified a significant amount of information on salmonid habitat that will be useful in recovery and restoration planning. One of the primary lessons of the WRIP is that information regarding salmonids in the State of Washington is very dispersed and variable. The time allotted to the WRIP limited the comprehensiveness of the inventory both in number of entities responding and the completeness of each record of information. With additional effort, the quality of this information can be improved.

Geographic information for WRIP was collected at 1:100,000. This limits the amount of spatial data available on salmonid species, which use smaller tributaries not identified at 1:100,000, and the ability to pinpoint problems. Future efforts

should consider data collection at 1:24,000. Data collected at this scale will include the smaller tributaries and be even more useful in restoration planning.

Inconsistencies in information coverage can be found across the state and much of the information that can be found is anecdotal. Quantitative data on the connection between habitat quality and fish productivity is virtually non-existent. Much more data are compiled for fish barriers and water quality impairments than sedimentation and stream flow problems. Because of state and federal watershed analysis, more information has been compiled for forested habitats than agricultural and urban landscapes. Quality of information varies by geographic location. A significant amount of information can be found in some WRIAs whereas there is virtually no information for others. Generally, more information has been compiled for the Puget Sound region and Olympic Peninsula than the Columbia River basin. Reasons for this disparity include lack of connection with appropriate data managers, lack of response to the surveys, as well as paucity of information.

Information is available for all of the high priority watersheds. However, it too is variable and further work should be done to identify data gaps by issue and geographic area.

The information gathered through the WRIP should be analyzed to provide answers to the questions that when considering salmonid recovery, such as: What is the relationship of hydro-modifications to stream channel flow within this basin? is mass wasting potential a significant risk to spawning habitat in this basin? are there sufficient off channel rearing areas for the size of the coho population in this drainage? As well, the habitat information may be used to verify the type and location of watershed restoration planned in a WRIA.

RECOMMENDATIONS FOR THE FUTURE

Continue the Current Effort

The WRIP has been received with interest and support by the Joint Natural Resource Cabinet, local government, and nonprofit organizations. Response to the request for information was limited, both within and outside of WDFW, by planned field activities, other project deadlines, the lack of organization of existing data, and planned leave time.

Continuing the current effort will allow us to verify existing information and prepare a more complete inventory of salmonid habitat information. This continuation would result in a more comprehensive data directory and list of ready-to-fund projects, as well as improved confidence in the product.

Conduct Systematic Habitat Inventories

The draft EIS for the Wild Salmonid Policy identified a number of factors which affect fish populations. Several of these factors have had little information collected on them. These factors include riparian quality, ecological interactions, lakes and reservoirs, marine interactions, and others. Data collection on these factors would improve the quality of salmonid recovery plans. In addition, much of the data we do have is probably not adequate to effectively and quantitatively link habitat to fish productivity parameters. Evaluation studies are needed to assess current habitat quality and establish linkages to productivity.

Prepare Analytical Models

The WRIP has identified a significant amount of information on salmon habitat. This information exists in different software programs and formats. It is therefore still difficult to determine the factors which limit fish production or which factors should be addressed first. Data applications need to be established and pertinent data modified to function in a relational database. Analytical models need to be developed that allow the data to help us answer questions pertinent to salmon recovery. This type of analysis has already been conducted in WRIAs 1-23 by SSHIAP. Continuing the SSHIAP process throughout the state would result in a quantitative GIS database that identifies factors which affect fish productivity and restoration and protection projects which address those factors.

Analysis of information improves the state's ability to target funds for salmonid recovery more effectively. It may also be possible to streamline some agency activities through the development of computer models. A number of models already exist that may be used in this effort.

Improve the Scale of Data Resolution

Geographic information collected in the WRIP was mapped at 1:100,000. Information mapped at this scale favors fish species which use large tributaries and main stem habitat. Information on coho and resident fish habitat is limited by the lack of smaller tributaries displayed. As well, many stream modifications and restoration projects take place on smaller streams. The ability to map at 1:24,000 scale would allow us to improve the identification of causal factors in watershed degradation. At 1:24,000, information may be used for quantitative analysis and project planning, as it is in SSHIAP.

Maintain Data Currency

A common frustration of data users is the currency, or rather lack of currency, of information. Because of the lack of current data, decisions are made, at least in part, on out-of-date information. An example of this is *A Catalog of Washington Streams and Salmon Utilization* written in 1975. The catalog identifies species distribution, production and harvest, and limiting factors. Despite the fact that significant land use changes have been made since the document was written and that species distribution has changed, it remains the most common reference for stream information.

To maximize effectiveness, information and data need to be maintained and regularly updated. Data update forms need to be developed, circulated, and used. In addition, staff must be dedicated to update the database.

Improve Data Access

To maximize effectiveness, information also needs to be easily available to agency employees and the public. Access to current information improves the quality of watershed planning and projects. Access may be provided through data requests, the Internet, or reports. Existing opportunities for data distribution should be used but still require dedicated staff time and funding.

Improve Data Management

It is generally agreed that better data coordination would help facilitate better agency coordination within watersheds. As well, it would help local watershed groups develop good basin assessments from which to plan projects. Data management establishes a process and standards for the collection, entry, and maintenance of data.

Improve Restoration Planning

Several questions have been identified in watershed restoration, including: How do we determine which projects to support and/or implement? what type of restoration project do we feel is successful? when is natural recovery acceptable and how do we know? how do we coordinate agency programs on restoration to maximize the benefits for the ecosystem? how can we promote bioengineering? what role should our agency play in restoration in relation to that of the public, federal agencies, or tribes? who is the point of contact for inquiries about agency restoration activities?

Tools that would assist the agency in guiding effective restoration include the development of agency restoration policy, standards, in-house training, and guidance document development. While this would require significant effort within the agency, it would improve the effectiveness of salmonid restoration.

Improve Accountability

It is important to determine the effectiveness of protection and restoration efforts and whether watershed plans are achieving the intended outcomes. To determine this effectiveness, criteria should be developed which help evaluate the likelihood that a project will assist in reaching recovery goals. As well, performance measures should be established for implementation and project effectiveness. These performance measures should reflect the outcomes that are considered essential for success in salmonid recovery. While performance measures for implementation are easily defined, effectiveness measures are not well established as linkages between habitat quality and fish productivity are not well understood. To ensure performance measures are evaluated, a systematic monitoring program should be established.

APPENDICES

LIST OF ACRONYMS USED

BLM -	Bureau of Land Management
BPA -	Bonneville Power Administration
COE -	Army Corps of Engineers
DOE -	Washington Department of Ecology
DOH -	Department of Health
DOT -	Department of Transportation
EPA -	Environmental Protection Agency
ESU -	Evolutionarily Significant Units
FBD -	Future Brood Document
GIS -	Geographic Information System
LWD -	Large Woody Debris
NMFS -	National Marine Fisheries Service
NOAA -	National Oceanic and Atmospheric Administration
NWIFC -	Northwest Indian Fisheries Commission
PUD -	Public Utilities District
SEPA -	State Environmental Policy Act
SSHEAR -	Salmon Screening, Habitat Enhancement and Restoration
SSHIAP -	Salmon and Steelhead Habitat Information and Assessment Project
TDML -	Total Daily Maximum Load
TFW -	Timber, Fish and Wildlife
TSS -	Total Suspended Solids
USFS -	U.S. Forest Service
USFWS -	U.S. Fish and Wildlife Service
USGS -	U.S. Geological Survey
WAU -	Watershed Administrative Unit
WDFW -	Washington Department of Fish and Wildlife
WRIA -	Watershed Resource Inventory Area
WRIP -	Watershed Recovery Inventory Project

Information was summarized for publication in this report. For the complete information collected, download the WRIP spreadsheets from the Washington Department of Fish and Wildlife homepage (www.wa.gov/wdfw/).